respective years; and the aggregate cost of sulphuric acid and pyrites and sulphur constituted 13.2 per cent. of the total in 1899, 11 per cent. in 1904, and 11.2 per cent. in 1909. All fertilizer establishments manufacturing sulphuric acid employed the chamber process, sixteen using the Hoffman intensifier system, eleven the Pratt, nine the Gilchrist, three the Meyer tangential system, and one the Luney. The manufacture, for consumption in their own works, of 1,826,358 tons of acid phosphate was reported by establishments engaged primarily in the fertilizer industry, and 12,507 tons were made and consumed by establishments manufacturing fertilizers as a subsidiary product.

All records have been broken in the great mineral production of the United States for the year 1912. The year 1907 has heretofore been the banner year of American mineral output, with a total value of $2,072,666,639, but even this great figure was exceeded in 1912 by over $170,000,000. As compared with 1911, the increase in 1912 is $316,098,198, or 16.40 per cent. These figures are shown in a summary of the mineral production of the United States for 1912, compiled by W. T. Thom, of the United States Geological Survey, now in press. As heretofore, iron and coal are the most important of our mineral products. The value of iron (pig iron being the basis of valuation) in 1912 was $420,563,388; the value of coal was $695,606,071. The value of the fuels—coal, natural gas and petroleum—increased from $835,231,497 in 1911 to $943,972,362 in 1912, a gain of $108,740,865. Coal showed an increase in value of $60,040,860, from $626,565,211 in 1911 to $695,606,071 in 1912. The production of metals increased in value $186,571,303, from $680,531,782 in 1911 to $867,103,085 in 1912. The nonmetals increased $129,276,895, from $1,246,750,346 in 1911 to $1,376,027,241 in 1912. The unspecified products, including cadmium, selenium, rutile, uranium, vanadium and other minerals, valued at $500,000, increased $250,000, bringing the total value of the mineral production for 1912 up to $2,243,630,326. The production of pig iron in 1912 gained more than $93,000,000, or 28 per cent.; ferro-alloys gained nearly $4,000,000, or about 46 per cent.; silver gained more than $6,000,000, or 20 per cent.; copper gained about $68,000,000, or nearly 50 per cent.; zinc gained nearly $14,000,000, or 44 per cent., and aluminum gained nearly $4,000,000, or 47 per cent. Gold, which lost about $3,500,000, was the only important metal to show a decrease. Among the nonmetals bituminous coal gained approximately $67,000,000, or about 15 per cent.; anthracite coal gained more than $2,000,000; natural gas gained almost $10,000,000, or 13 per cent.; petroleum gained nearly $30,000,000, or 22 per cent.; clay products gained more than $10,000,000, or 6.5 per cent., and sulphuric acid from copper and zinc smelters (a product mined as it were out of the air and changed from a destructive waste to an absolute gain) increased $1,500,000, or 55 per cent.

UNIVERSITY AND EDUCATIONAL NEWS

An anonymous gift of $100,000 has been made to Wellesley College. The money was given towards the million-dollar fund which the college is trying to raise as an endowment. The total amount obtained thus far is $453,000.

Yale University has received a gift of $50,000 from Mr. Charles H. Pine, of Ansonia, Conn., to be used for scholarships under terms to be announced later.

Dr. Francis Gray Smart, of Tunbridge Wells, has left £10,000 to Gonville and Caius College, Cambridge, for two "Frank Smart Studentships" in natural history or botany, and if this sum shall be more than sufficient to provide for these studentships the balance is to be used to promote the study of these subjects in that college.

Mr. Otto Beit has given £2,000 to Cambridge University for a library of German books, together with £1,000, of which the income is to be devoted to additions.

The certificated teachers of Herefordshire have decided to take action in a body with a view to compelling the education authority to redress the grievances from which they allege

they suffer. The first group of about 100 resignations has been sent in to terminate on January 31, 1914, these being resignations of headmasters and headmistresses only. For various reasons the remainder of the resignations are being delayed for consideration by the executive of the National Union of Teachers.

AT the University of Chicago, Elbert Clark has been appointed instructor in anatomy, and Cora C. Colburn, instructor in home economics.

MR. J. H. MUNCIE, assistant pathologist at the Ohio Agricultural Experiment Station at Wooster, Ohio, has been appointed assistant in plant pathology at the Michigan Agricultural College, beginning with November 17.

AT the Worcester Polytechnic Institute Assistant Professors D. L. Gallup and Frederic Bonnet, Jr., have been advanced to full professorships in gas engineering and chemistry, respectively. Dr. D. F. Calhane, instructor in industrial and electro-chemistry, has been appointed assistant professor in his department. P. W. Brouwers, '13, returns to the institute as instructor in mathematics, and G. S. Simpson, who graduated from the University of Maine last June, becomes assistant in chemistry, replacing E. B. Peck, who has taken up a course of graduate work at the Massachusetts Institute of Technology.

THE University of Minnesota added to its scientific faculties, this year, the following new members: Dr. E. P. Lyon as dean of the College of Medicine; as professors: Frederick J. Alway in agriculture, Josephine T. Berry in home economics, Arthur D. Hirschfelder in medicine, C. M. Jackson in medicine, F. M. Mann in architectural engineering, Adolph F. Meyer in engineering, Roscoe W. Thatcher in agriculture, George T. Young in mining, and T. B. Hutcheson in agriculture; as assistant professors: Alva Hartley Benton in agriculture, W. H. Brierly in agriculture, Robert C. Dahlberg in agriculture, R. L. Donovan in agriculture, Robert A. Hall in medicine, Estelle L. Jensen in agriculture, Francis Jager in agriculture, R. S. Mackintosh in agriculture, T. B. McCulloch in agriculture, Peter J. Olson in agriculture, C. C. Palmar in agriculture, C. J. Posey in geology, Richard Wellington in agriculture and George A. Works in agriculture; as instructors: George D. Allen in animal biology, W. O. Beal in astronomy, E. C. Davis in agriculture, R. Dietrichson in chemistry, John T. E. Dinwoodie in agriculture, Albert M. Gilbertson in anthropology, Julian H. Gist in agriculture, Alex. R. Hall in medicine, Arthur T. Henrici in medicine, R. C. Jones in engineering, F. B. Kingsbury in medicine, W. Kritchevsky in chemistry, H. J. Leonard in dentistry, Mabel McDowell in agriculture, W. L. Miser in mathematics, Agnes Morton in agriculture, D. O. Ostergren in dentistry, Rollin M. Pease in agriculture, R. M. Peterson in agriculture, E. R. Pinney in dentistry, A. C. Potter in medicine, C. H. Rogers in pharmacy, C. O. Rost in agriculture, H. C. Samuels in dentistry, J. F. Shellman in dentistry, E. K. Strachan in chemistry, H. M. Sheffer in psychology, Frank Smithey in medicine, Mabel Barbara Trilling in agriculture, Grace T. Williams in agriculture, Robert Wilson in agriculture and J. J. Willaman in agriculture.

DURING the past year the following appointments have been made for persons who have graduated at the University of Illinois or who have been there within two years as graduate students in chemistry.

J. E. Bell, instructor in chemistry, University of Washington, Seattle, Wash.

R. A. Dutcher, instructor in agricultural chemistry, Agriculture College, Corvallis, Oregon.

J. E. Egan, assistant professor of chemistry, Miami University, Oxford, Ohio.

H. B. Gordon, assistant professor, Agricultural and Mechanical College of Texas, College Station, Texas.

L. R. Littleton, professor of chemistry, Emory and Henry College, Emory, Virginia.

W. S. Long, assistant professor of chemistry, in charge of the food laboratory, Lawrence, Kansas.

C. Ferdinand Nelson, assistant professor of physiological chemistry, University of Kansas, Lawrence, Kansas.

L. F. Nickell, instructor in chemistry, Washington University, St. Louis, Missouri.

H. L. Olin, instructor in chemistry, Vassar College, Poughkeepsie, N. Y.

R. S. Potter, research assistant, Agricultural Experiment Station, Iowa State College, Ames, Iowa.

E. K. Strachan, instructor in chemistry, University of Minnesota, Minneapolis, Minn.

G. Y. Williams, associate professor of chemistry and acting head of the chemistry department in the State University of Oklahoma, Norman, Oklahoma.

P. S. Woodward, instructor, Georgia School of Technology, Atlanta, Georgia.

The electors to the Waynflete professorship of physiology at Oxford, vacant by the death of Dr. Francis Gotch, have elected Dr. Charles Scott Sherrington. Dr. Sherrington succeeded Dr. Gotch as Holt professor of physiology at the University of Liverpool in 1895, when Dr. Gotch was called to Oxford.

DISCUSSION AND CORRESPONDENCE

MATHEMATICAL DEFINITIONS IN THE NEW STANDARD DICTIONARY

Funk and Wagnalls's "New Standard Dictionary of the English Language," 1913, has many merits and will doubtless be used very extensively. It is, therefore, of special importance to direct public attention to the fact that this dictionary is not reliable as regards definitions of mathematical terms. Some of these definitions will doubtless interest even those who remember only a little of their mathematics, as they relate to elementary matters and are so evidently incorrect. The following list of examples could easily have been extended, but it is believed that it will not require many examples of this type to convince the reader.

Under the term *algebra* it is stated that the infinitesimal calculus and the theory of functions may be classed among "the principal branches of algebra." A hundred years ago such a statement might have appeared proper, but it is not in accord with any of the classifications which have been extensively adopted in recent years, such as those employed in the International Catalogue of Scientific Literature and in the large mathematical encyclopedias which are in the course of publication. In fact, the infinitesimal calculus and the theory of functions are generally regarded as branches of analysis.

The explanations which follow the term *arithmetic* include the statement that the early Pythagoreans first studied arithmetic. On the contrary, it is well known that the ancient Babylonians and Egyptians made considerable use of elementary arithmetic, as may be seen from the extensive mathematical tables of the ancient Babylonians and the large collection of examples by the Egyptian scribe Ahmes. Possibly the early Pythagoreans might be regarded as the first workers in higher arithmetic or the theory of numbers.

An instance of a statement which is more evidently incorrect appears under the term *dimension.* It is here stated that four-dimensional space may be regarded as a hypothetical conception to explain equations of the fourth degree in analytical geometry. As a matter of fact an equation of any degree in two variables may be represented geometrically in the plane. It is the number of the variables and not the *degree* of an equation which corresponds to the number of dimensions required for its representation.

Under the term *equation* it is stated that an abelian equation is an equation "all of whose roots are rational functions of one or more of the roots." It is well known that the roots of non-abelian equations may also be rational functions of each other. In an abelian equation we must have the additional condition that its group is commutative.

A fractional function is defined, under the term *function,* as one whose variable appears only in its denominator; and a *Galois resolvent* is said to be "that resolvent of an equation whose roots remain the same when the group of the equation is permuted in any way whatever." It would be interesting to know something about the new theory of permuting the group of an equation. Unfortunately there seems to be no clue in this dictionary as regards the possible meaning of this term.

The most original definitions seem to appear under the term *group.* A complete group is defined as one in which no self-conjugate operations are possible besides the iden-